

Amendments to the Claims:

The following listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Original) A ferroelectric film including a perovskite ferroelectric or a bismuth layer-structured ferroelectric shown by ABO_3 or $(\text{Bi}_2\text{O}_2)^{2+}(\text{A}_{m-1}\text{B}_m\text{O}_{3m+1})^{2-}$ (wherein A represents at least one ion selected from the group consisting of Li^+ , Na^+ , K^+ , Pb^{2+} , Ca^{2+} , Sr^{2+} , Ba^{2+} , Bi^{3+} and La^{3+} , B represents at least one ion selected from the group consisting of Fe^{3+} , Ti^{4+} , Zr^{4+} , Nb^{5+} , Ta^{5+} , W^{6+} and Mo^{6+} , and m is a natural number),

wherein at least four-fold coordinated Si^{4+} or Ge^{4+} is included in the A site ion.

2. (Original) A ferroelectric film including a perovskite ferroelectric or a bismuth layer-structured ferroelectric shown by ABO_3 or $(\text{Bi}_2\text{O}_2)^{2+}(\text{A}_{m-1}\text{B}_m\text{O}_{3m+1})^{2-}$ (wherein A represents at least one ion selected from the group consisting of Li^+ , Na^+ , K^+ , Pb^{2+} , Ca^{2+} , Sr^{2+} , Ba^{2+} , Bi^{3+} and La^{3+} , B represents at least one ion selected from the group consisting of Fe^{3+} , Ti^{4+} , Zr^{4+} , Nb^{5+} , Ta^{5+} , W^{6+} and Mo^{6+} , and m is a natural number),

wherein at least four-fold coordinated Si^{4+} or Ge^{4+} is included in the A site ion; and

wherein the ferroelectric film is a solid solution with a dielectric shown by X_2SiO_5 , $\text{X}_4\text{Si}_3\text{O}_{12}$, X_2GeO_5 or $\text{X}_4\text{Ge}_3\text{O}_{12}$ (wherein X represents Bi^{3+} , Fe^{3+} , Sc^{3+} , Y^{3+} , La^{3+} , Ce^{3+} , Pr^{3+} , Nd^{3+} , Pm^{3+} , Sm^{3+} , Eu^{3+} , Gd^{3+} , Tb^{3+} , Dy^{3+} , Ho^{3+} , Er^{3+} , Tm^{3+} , Yb^{3+} or Lu^{3+}).

3. (Original) A ferroelectric film including a perovskite ferroelectric or a bismuth layer-structured ferroelectric shown by ABO_3 or $(\text{Bi}_2\text{O}_2)^{2+}(\text{A}_{m-1}\text{B}_m\text{O}_{3m+1})^{2-}$ (wherein A represents at least one ion selected from the group consisting of Li^+ , Na^+ , K^+ , Pb^{2+} , Ca^{2+} , Sr^{2+} , Ba^{2+} , Bi^{3+}

and La^{3+} , B represents at least one ion selected from the group consisting of Fe^{3+} , Ti^{4+} , Zr^{4+} , Nb^{5+} , Ta^{5+} , W^{6+} and Mo^{6+} , and m is a natural number),

wherein at least four-fold coordinated Si^{4+} or Ge^{4+} is included in the A site ion; and

wherein the ferroelectric film includes at least one transition element in an amount of 5 to 40 mol% in total, the transition element having the maximum positive valence which is +1 or more greater than the valence of the A site ion of the ABO_3 or $(\text{Bi}_2\text{O}_2)^{2+}(\text{A}_{m-1}\text{B}_m\text{O}_{3m+1})^{2-}$.

4. (Original) A ferroelectric film including a perovskite ferroelectric or a bismuth layer-structured ferroelectric shown by ABO_3 or $(\text{Bi}_2\text{O}_2)^{2+}(\text{A}_{m-1}\text{B}_m\text{O}_{3m+1})^{2-}$ (wherein A represents at least one ion selected from the group consisting of Li^+ , Na^+ , K^+ , Pb^{2+} , Ca^{2+} , Sr^{2+} , Ba^{2+} , Bi^{3+} and La^{3+} , B represents at least one ion selected from the group consisting of Fe^{3+} , Ti^{4+} , Zr^{4+} , Nb^{5+} , Ta^{5+} , W^{6+} and Mo^{6+} , and m is a natural number),

wherein at least four-fold coordinated Si^{4+} or Ge^{4+} is included in the A site ion; and

wherein the ferroelectric film includes at least one transition element in an amount of 5 to 40 mol% in total, the transition element having the maximum positive valence which is +1 or more greater than the valence of the B site ion of the ABO_3 or $(\text{Bi}_2\text{O}_2)^{2+}(\text{A}_{m-1}\text{B}_m\text{O}_{3m+1})^{2-}$.

5. (Original) A ferroelectric film including a perovskite ferroelectric or a bismuth layer-structured ferroelectric shown by ABO_3 or $(\text{Bi}_2\text{O}_2)^{2+}(\text{A}_{m-1}\text{B}_m\text{O}_{3m+1})^{2-}$ (wherein A represents at least one ion selected from the group consisting of Li^+ , Na^+ , K^+ , Pb^{2+} , Ca^{2+} , Sr^{2+} , Ba^{2+} , Bi^{3+} and La^{3+} , B represents at least one ion selected from the group consisting of Fe^{3+} , Ti^{4+} , Zr^{4+} , Nb^{5+} , Ta^{5+} , W^{6+} and Mo^{6+} , and m is a natural number),

wherein at least four-fold coordinated Si^{4+} or Ge^{4+} is included in the A site ion;

wherein the ferroelectric film includes at least one transition element having the maximum positive valence which is +1 or more greater than the valence of the B site ion of the ABO_3 or $(\text{Bi}_2\text{O}_2)^{2+}(\text{A}_{m-1}\text{B}_m\text{O}_{3m+1})^{2-}$;

wherein the ferroelectric film includes at least one transition element having the maximum positive valence which is +1 or more greater than the valence of the A site ion of the ABO_3 or $(\text{Bi}_2\text{O}_2)^{2+}(\text{A}_{m-1}\text{B}_m\text{O}_{3m+1})^{2-}$; and

wherein the transition elements are included in an amount of 5 to 40 mol% in the A and B sites in total.

6. (Original) A ferroelectric film including a perovskite ferroelectric or a bismuth layer-structured ferroelectric shown by ABO_3 or $(\text{Bi}_2\text{O}_2)^{2+}(\text{A}_{m-1}\text{B}_m\text{O}_{3m+1})^{2-}$ (wherein A represents at least one ion selected from the group consisting of Li^+ , Na^+ , K^+ , Pb^{2+} , Ca^{2+} , Sr^{2+} , Ba^{2+} , Bi^{3+} and La^{3+} , B represents at least one ion selected from the group consisting of Fe^{3+} , Ti^{4+} , Zr^{4+} , Nb^{5+} , Ta^{5+} , W^{6+} and Mo^{6+} , and m is a natural number),

wherein at least four-fold coordinated Si^{4+} or Ge^{4+} is included in the A site ion;

wherein the ferroelectric film is a solid solution with a dielectric shown by X_2SiO_5 , $\text{X}_4\text{Si}_3\text{O}_{12}$, X_2GeO_5 or $\text{X}_4\text{Ge}_3\text{O}_{12}$ (wherein X represents Bi^{3+} , Fe^{3+} , Sc^{3+} , Y^{3+} , La^{3+} , Ce^{3+} , Pr^{3+} , Nd^{3+} , Pm^{3+} , Sm^{3+} , Eu^{3+} , Gd^{3+} , Tb^{3+} , Dy^{3+} , Ho^{3+} , Er^{3+} , Tm^{3+} , Yb^{3+} or Lu^{3+}); and

wherein the ferroelectric film includes at least one transition element in an amount of 5 to 40 mol% in total, the transition element having the maximum positive valence which is +1 or more greater than the valence of the A site ion of the ABO_3 or $(\text{Bi}_2\text{O}_2)^{2+}(\text{A}_{m-1}\text{B}_m\text{O}_{3m+1})^{2-}$.

7. (Original) A ferroelectric film including a perovskite ferroelectric or a bismuth layer-structured ferroelectric shown by ABO_3 or $(\text{Bi}_2\text{O}_2)^{2+}(\text{A}_{m-1}\text{B}_m\text{O}_{3m+1})^{2-}$ (wherein A represents at

least one ion selected from the group consisting of Li^+ , Na^+ , K^+ , Pb^{2+} , Ca^{2+} , Sr^{2+} , Ba^{2+} , Bi^{3+} and La^{3+} , B represents at least one ion selected from the group consisting of Fe^{3+} , Ti^{4+} , Zr^{4+} , Nb^{5+} , Ta^{5+} , W^{6+} and Mo^{6+} , and m is a natural number),

wherein at least four-fold coordinated Si^{4+} or Ge^{4+} is included in the A site ion;

wherein the ferroelectric film is a solid solution with a dielectric shown by X_2SiO_5 , $\text{X}_4\text{Si}_3\text{O}_{12}$, X_2GeO_5 or $\text{X}_4\text{Ge}_3\text{O}_{12}$ (wherein X represents Bi^{3+} , Fe^{3+} , Sc^{3+} , Y^{3+} , La^{3+} , Ce^{3+} , Pr^{3+} , Nd^{3+} , Pm^{3+} , Sm^{3+} , Eu^{3+} , Gd^{3+} , Tb^{3+} , Dy^{3+} , Ho^{3+} , Er^{3+} , Tm^{3+} , Yb^{3+} or Lu^{3+}); and

wherein the ferroelectric film includes at least one transition element in an amount of 5 to 40 mol% in total, the transition element having the maximum positive valence which is +1 or more greater than the valence of the B site ion of the ABO_3 or $(\text{Bi}_2\text{O}_2)^{2+}(\text{A}_{m-1}\text{B}_m\text{O}_{3m+1})^{2-}$

8. (Original) A ferroelectric film including a perovskite ferroelectric or a bismuth layer-structured ferroelectric shown by ABO_3 or $(\text{Bi}_2\text{O}_2)^{2+}(\text{A}_{m-1}\text{B}_m\text{O}_{3m+1})^{2-}$ (wherein A represents at least one ion selected from the group consisting of Li^+ , Na^+ , K^+ , Pb^{2+} , Ca^{2+} , Sr^{2+} , Ba^{2+} , Bi^{3+} and La^{3+} , B represents at least one ion selected from the group consisting of Fe^{3+} , Ti^{4+} , Zr^{4+} , Nb^{5+} , Ta^{5+} , W^{6+} and Mo^{6+} , and m is a natural number),

wherein at least four-fold coordinated Si^{4+} or Ge^{4+} is included in the A site ion;

wherein the ferroelectric film is a solid solution with a dielectric shown by X_2SiO_5 , $\text{X}_4\text{Si}_3\text{O}_{12}$, X_2GeO_5 or $\text{X}_4\text{Ge}_3\text{O}_{12}$ (wherein X represents Bi^{3+} , Fe^{3+} , Sc^{3+} , Y^{3+} , La^{3+} , Ce^{3+} , Pr^{3+} , Nd^{3+} , Pm^{3+} , Sm^{3+} , Eu^{3+} , Gd^{3+} , Tb^{3+} , Dy^{3+} , Ho^{3+} , Er^{3+} , Tm^{3+} , Yb^{3+} or Lu^{3+});

wherein the ferroelectric film includes at least one transition element having the maximum positive valence which is +1 or more greater than the valence of the B site ion of the ABO_3 or $(\text{Bi}_2\text{O}_2)^{2+}(\text{A}_{m-1}\text{B}_m\text{O}_{3m+1})^{2-}$;

wherein the ferroelectric film includes at least one transition element having the maximum positive valence which is +1 or more greater than the valence of the A site ion of the ABO_3 or $(\text{Bi}_2\text{O}_2)^{2+}(\text{A}_{m-1}\text{B}_m\text{O}_{3m+1})^{2-}$; and

wherein the transition elements are included in an amount of 5 to 40 mol% in the A and B sites in total.

9. (Currently Amended) The ferroelectric film as defined in ~~any of claims 1 to 8~~,
claim 1, wherein the ferroelectric film includes $\text{Pb}(\text{Zr}, \text{Ti})\text{O}_3$ which includes at least four-fold coordinated Si^{4+} or Ge^{4+} in the A site ion in an amount of 1% or more; and
wherein at least one transition element having the maximum positive valence of +3 or more is included in the A site in an amount of 5 to 40 mol% in total.

10. (Currently Amended) The ferroelectric film as defined in ~~any of claims 1 to 8~~,
claim 1, wherein the ferroelectric film includes $\text{Pb}(\text{Zr}, \text{Ti})\text{O}_3$ which includes at least four-fold coordinated Si^{4+} or Ge^{4+} in the A site ion in an amount of 1% or more; and
wherein at least one transition element having the maximum positive valence of +5 or more is included in the B site in an amount of 5 to 40 mol% in total.

11. (Original) A ferroelectric film including $\text{Pb}(\text{Zr}, \text{Ti})\text{O}_3$ which includes at least four-fold coordinated Si^{4+} or Ge^{4+} in the Pb site ion in an amount of 1% or more,
wherein at least one transition element having the maximum positive valence of +3 or more is included in the Pb site;
wherein at least one transition element having the maximum positive valence of +5 or more is included in the Zr or Ti site; and

wherein the transition elements are included in an amount of 5 to 40 mol% in the Pb and Zr or Ti sites in total.

12. (Original) A ferroelectric film including $\text{Pb}(\text{Zr}, \text{Ti})\text{O}_3$ which includes at least four-fold coordinated Si^{4+} or Ge^{4+} in the Pb site ion in an amount of 1% or more,

wherein at least one of La and other lanthanoid series ions is included in the Pb site in an amount of 5 to 40 mol% in total.

13. (Original) A ferroelectric film including $\text{Pb}(\text{Zr}, \text{Ti})\text{O}_3$ which includes at least four-fold coordinated Si^{4+} or Ge^{4+} in the Pb site ion in an amount of 1% or more,

wherein at least one of Nb, V and W is included in the Zr or Ti site in an amount of 5 to 40 mol% in total.

14. (Original) A ferroelectric film including $\text{Pb}(\text{Zr}, \text{Ti})\text{O}_3$ which includes at least four-fold coordinated Si^{4+} or Ge^{4+} in the Pb site ion in an amount of 1% or more,

wherein at least one of La and other lanthanoid series ions is included in the Pb site, and at least one of Nb, V and W is included in the Zr or Ti site, in an amount of 5 to 40 mol% in the Pb and Zr or Ti sites in total.

15. (Currently Amended) The ferroelectric film as defined in ~~any of claim 11 to 14, claim 11~~, further including:

at least one of Nb, V and W in the Zr or Ti site in an amount twice the amount of Pb ion vacancy in the Pb site.

16. (Currently Amended) The ferroelectric film as defined in ~~any of claims 11 to 14~~ claim 11 is included (111)-oriented tetragonal crystals.

17. (Currently Amended) The ferroelectric film as defined in ~~any of claims 11 to 14~~ claim 11 is included (001)-oriented rhombohedral crystals.

18. (Original) A method of manufacturing a ferroelectric film including Pb(Zr,Ti)O₃, the method comprising:

using a sol-gel solution for forming Pb(Zr,Ti)O₃ which includes at least four-fold coordinated Si⁴⁺ or Ge⁴⁺ in the Pb site ion in an amount of 1% or more.

19. (Original) A method of manufacturing a ferroelectric film including Pb(Zr,Ti)O₃, the method comprising:

using a sol-gel solution for forming Pb(Zr,Ti)O₃ which includes at least four-fold coordinated Si⁴⁺ or Ge⁴⁺ in the Pb site ion in an amount of 1% or more,

wherein a mixed solution prepared by mixing a sol-gel solution for forming PbZrO₃ which includes at least four-fold coordinated Si⁴⁺ or Ge⁴⁺ in the Pb site ion in an amount of 1% or more with a sol-gel solution for forming PbTiO₃ which includes at least four-fold coordinated Si⁴⁺ or Ge⁴⁺ in the Pb site ion in an amount of 1% or more is used as the sol-gel solution for forming Pb(Zr,Ti)O₃.

20. (Original) A method of manufacturing a ferroelectric film including Pb(Zr,Ti)O₃, the method comprising:

using a sol-gel solution for forming $\text{Pb}(\text{Zr},\text{Ti})\text{O}_3$ in which the amount of Pb ranges from 90 to 120% of the stoichiometric composition of $\text{Pb}(\text{Zr},\text{Ti})\text{O}_3$.

21. (Currently Amended) The ferroelectric film as defined in ~~any of claims 1 to 8~~,
claim 1, wherein the ferroelectric film includes $\text{Bi}_4\text{Ti}_3\text{O}_{12}$ including at least four-fold coordinated Si^{4+} or Ge^{4+} in the A site ion in an amount of 1% or more; and
wherein at least one transition element having the maximum positive valence of +4 or more is included in the A site in an amount of 5 to 40 mol% in total.

22. (Currently Amended) The ferroelectric film as defined in ~~any of claims 1 to 8~~,
claim 1, wherein the ferroelectric film includes $\text{Bi}_4\text{Ti}_3\text{O}_{12}$ including at least four-fold coordinated Si^{4+} or Ge^{4+} in the A site ion in an amount of 1% or more; and
wherein at least one transition element having the maximum positive valence of +5 or more is included in the B site in an amount of 5 to 40 mol% in total.

23. (Original) A ferroelectric film including $\text{Bi}_4\text{Ti}_3\text{O}_{12}$ including at least four-fold coordinated Si^{4+} or Ge^{4+} in the Bi site ion in an amount of 1% or more,
wherein at least one transition element having the maximum positive valence of +4 or more is included in the Bi site;
wherein at least one transition element having the maximum positive valence of +5 or more is included in the Ti site; and
wherein the transition elements are included in an amount of 5 to 40 mol% in the Bi and Ti sites in total.

24. (Original) A ferroelectric film including $\text{Bi}_4\text{Ti}_3\text{O}_{12}$ including at least four-fold coordinated Si^{4+} or Ge^{4+} in the Bi site ion in an amount of 1% or more, wherein at least one of Nb, V and W is included in the Ti site in an amount of 5 to 40 mol% in total.

25. (Currently Amended) The ferroelectric film as defined in ~~claim 23 or 24~~, claim 23, further including:

at least one of Nb, V, and W in the Ti site in an amount twice the amount of Bi ion vacancy in the Bi site.

26. (Currently Amended) The ferroelectric film as defined in ~~claim 23 or 24~~ claim 23 is included (111), (110), and (117) oriented orthorhombic crystals.

27. (Original) A method of manufacturing a ferroelectric film including $\text{Bi}_4\text{Ti}_3\text{O}_{12}$, the method comprising:

using a sol-gel solution for forming $\text{Bi}_4\text{Ti}_3\text{O}_{12}$ which includes at least four-fold coordinated Si^{4+} or Ge^{4+} in the Bi site ion in an amount of 1% or more.

28. (Original) A method of manufacturing a ferroelectric film including $\text{Bi}_4\text{Ti}_3\text{O}_{12}$, the method comprising:

using a mixed solution prepared by mixing a solution prepared by mixing a sol-gel solution for forming Bi_2O_3 with a sol-gel solution for forming TiO_2 at a molar ratio of 2:3 with a sol-gel solution for forming a dielectric shown by X_2SiO_5 , $\text{X}_4\text{Si}_3\text{O}_{12}$, X_2GeO_5 , or $\text{X}_4\text{Ge}_3\text{O}_{12}$ (wherein X represents Bi^{3+} , Fe^{3+} , Sc^{3+} , Y^{3+} , La^{3+} , Ce^{3+} , Pr^{3+} , Nd^{3+} , Pm^{3+} , Sm^{3+} ,

Eu^{3+} , Gd^{3+} , Tb^{3+} , Dy^{3+} , Ho^{3+} , Er^{3+} , Tm^{3+} , Yb^{3+} , or Lu^{3+}) so that Si^{4+} or Ge^{4+} is included in an amount of 1 mol% or more.

29. (Original) A method of manufacturing a ferroelectric film including $\text{Bi}_4\text{Ti}_3\text{O}_{12}$, the method comprising:

using a sol-gel solution for forming $\text{Bi}_4\text{Ti}_3\text{O}_{12}$ in which an excess amount of Bi ranges from 90 to 120% of the stoichiometric composition of $\text{Bi}_4\text{Ti}_3\text{O}_{12}$.

30. (Currently Amended) A ferroelectric memory comprising the ferroelectric film as defined in ~~any of claims 1 to 17 and 21 to 26.~~ claim 1.

31. (Currently Amended) A piezoelectric device comprising the ferroelectric film as defined in ~~any of claims 1 to 7 and 21 to 26.~~ claim 1.